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Internal

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WATER QUALITY MEMORANDUM

Utah Coal Regulatory Program

March 31, 2011

TO: Internal File

THRU: Jim Smith, Permit Supervisor *DS 05 April 11*

FROM: Steve Christensen, Environmental Scientist *SCC*

RE: 2010 3rd Quarter Water Monitoring, Genwal Resources, Inc., Crandall Canyon Mine, Permit & Tracking #3625

Water monitoring requirements for the Crandall Canyon Mine can be found in Sections 7.31.21, *Ground Water Monitoring Plan* and 7.31.22, *Surface Water Monitoring Plan*. Additional information can be found in Tables 7-4, 7-5, 7-8, 7-9 and 7-10.

Water encountered during mining operations was pumped to the portals and discharged to Crandall Creek under UPDES Permit No. UTU0024368. Discharges to Crandall Creek were within the limitations established by the permit with rare exceptions. Prior to 2008 only sample reported an iron concentration greater than 1 mg/L (July 26, 2004 -1.08 mg/L).

Following the mine collapse in August 2007, the pumps were removed from the mine and discharge ceased temporarily. From September 2007 through December 2007 water pooled within the mine, flooding the underground workings. In January 2008 the mine began discharging by gravity flow and has been discharging continuously since. The temporary seals placed in the portals following the collapse required modification to control the mine water discharge. Iron concentrations in the mine water discharge occasionally exceeded 1 mg/L from January to November 2008; and have been greater than 1 mg/L continuously since December 2008. Construction of a mine water treatment system began in December 2009 and was approved by the Division in January of 2010.

Since April of 2010, the mine water treatment system has proven effective in reducing total iron concentrations to within the 1 mg/L UPDES limit. Additionally, the Permittee began sampling the pre-treatment raw mine water (Pre 002) in April of 2010. The sampling of the raw mine water is conducted in an effort to monitor changes in mine water chemistry that might indicate that the iron concentrations are going down. To date, the total iron concentrations in the raw mine-water remain above 1 mg/L.

1. Was data submitted for all of the MRP required sites? YES ☒ NO ☐

Springs

The approved MRP requires the monitoring of 24 springs each quarter. Of these 24 springs, 9 require laboratory water quality analysis (See Table 7-4). The remaining 15 springs require quarterly monitoring of field parameters (flow, pH, specific conductance and temperature).

Data was submitted for all of the required 24 spring monitoring sites.

Streams

The approved MRP requires the monitoring of 12 surface water/stream sites. Of these 12 surface water/stream sites, 9 require laboratory water quality analysis (See Table 7-8). The remaining 3 sites require quarterly monitoring of field parameters (flow, pH, specific conductance, temperature and dissolved oxygen).

Data was submitted for all stream monitoring sites.

Wells

The approved MRP outlines monitoring of 7 wells. According to Table 7-4, all 7 wells required quarterly laboratory water quality analysis. However, due to the mine disaster on August 6th, 2007, the active mine-workings have been sealed thus rendering the wells inaccessible.

UPDES

The UPDES Permit/MRP (UT000024368) requires monthly monitoring of 2 outfalls: 001 and 002. Outfall 001 is associated with the discharge from the primary sediment pond at the main mine facility. Outfall 002 is associated with the mine-water discharge that reports directly to Crandall Creek.

Outfall 001 did not report a discharge for this quarter. The required data was submitted for Outfall 002.

Pre-Treatment Mine Water Discharge

As part of the permitting process for the mine-water treatment system (Task ID #3461,

approved January 27th, 2010), the Permittee has committed to monthly sampling of the pre-treatment mine water discharge for the following parameters:

- Iron (total, dissolved and ferrous)
- Manganese (total and dissolved)
- Aluminum (total and dissolved)
- Alkalinity
- Sulfate
- pH
- Dissolved Oxygen

The required Monthly data was collected for the pre-treatment mine water discharge and submitted.

2. Were all required parameters reported for each site? YES ☒ NO ☐

Springs

All required parameters were reported for the spring monitoring sites.

Streams

All required parameters were reported for the surface water monitoring sites.

Wells

NA- Since the mine collapse in August of 2007, the monitoring wells are inaccessible.

UPDES

Outfall 001 did not report a discharge for this quarter. Outfall 002 was sampled each month of the quarter as required by the UPDES discharge permit. All required parameters were reported for Outfall 002.

As part of the approval for the mine-water treatment system (Task ID #3461), the Permittee committed to obtain additional monthly samples for Outfall 002. The parameters include (D-Fe, FE2+, T-Mn, D-Mn, T-Al, D-Al, Alkalinity and Sulfate). Concentrations were reported for each of the additional parameters at Outfall 002.

Pre-Treatment Mine Water Discharge

As discussed above, monthly sampling of the Pre-Treatment Mine Water Discharge

became a requirement with the approval of the mine-water discharge treatment system.

The required pre-treatment mine discharge parameters were reported this quarter as required.

3. Were any irregularities found in the data?

YES ☒ NO ☐

Springs

Several springs reported elevated levels of TDS and its primary components.

SP-36 data has historically produced spikes in D-Ca and D-K; the most recent occurring in the 4th quarter of 2009. The first and second quarters of 2010 produced D-Ca and D-K values within two standard deviations of the mean. However, a slight increase in D-K concentration was reported this quarter.

SP-30 reported a reduction in conductivity for the quarter. The reported value was 801 umhos/cm as the average conductivity value is 938 umhos/cm.

SP-58 reported elevated TDS and SO4 for a second consecutive quarter. The site was inaccessible the 1st quarter of 2010; however, elevated D-Ca was reported during the 4th quarter of 2009.

SP1-33 reported an elevated concentration of SO4 for the second consecutive quarter.

Streams

As the total iron (T-Fe) concentrations in the mine-water discharge began to increase, a concern was that a similar rise would be observed in stream monitoring site LOF-1 (lower Crandall Canyon flume). An upward trend of T-Fe began to surface the second quarter of 2008 in correspondence with the increase in iron concentrations of the mine-water discharge. A T-Fe concentration of 1.479 gpm was reported the fourth quarter of 2009. Once the mine-water treatment system came on-line during the 1st quarter of 2010, the iron concentrations detected at LOF-1 have dropped significantly with values of 0.503 mg/L, 0.106 mg/L and 0.6 mg/L for the 1st, 2nd and 3rd quarters of 2010 respectively.

Shingle Creek had reported elevated conductivity values the 4th quarter of 2009 as well as the 2nd quarter of 2010. Conductivity values were within established historical trends for the monitoring site this quarter.

UPF-1 (Upper Flume Crandall Creek) reported elevated SO₄, Total Hardness and TDS in the fourth quarter of 2009. All three parameters have been reported at markedly lower concentrations (well within two standard deviations from the mean) for the last three quarters. Continued monitoring will be conducted to evaluate potential trends.

UPDES Sites (001 and 002)

Outfall 001 reported no observable flow for the quarter.

Based upon three sampling events, outfall 002 reported an average flow value of 516 gpm. The T-Fe concentrations of the water discharging from the mine-water treatment basin were well within the 1.0 ppm standard established by the UPDES permit (0.17 ppm, 0.39 ppm and 0.68 ppm for July, August and September respectively). The mine-water treatment system continues to be effective in reducing the T-Fe concentrations.

4. On what date does the MRP require a five-year re-sampling of baseline water data.

Page 7-33 of the MRP states that groundwater samples collected during the low flow period (typically the 4th quarter) every 5 years will be analyzed for baseline parameters (See Tables 7-5). The 4th quarter of 2010 will be the next sampling event where baseline data will be required.

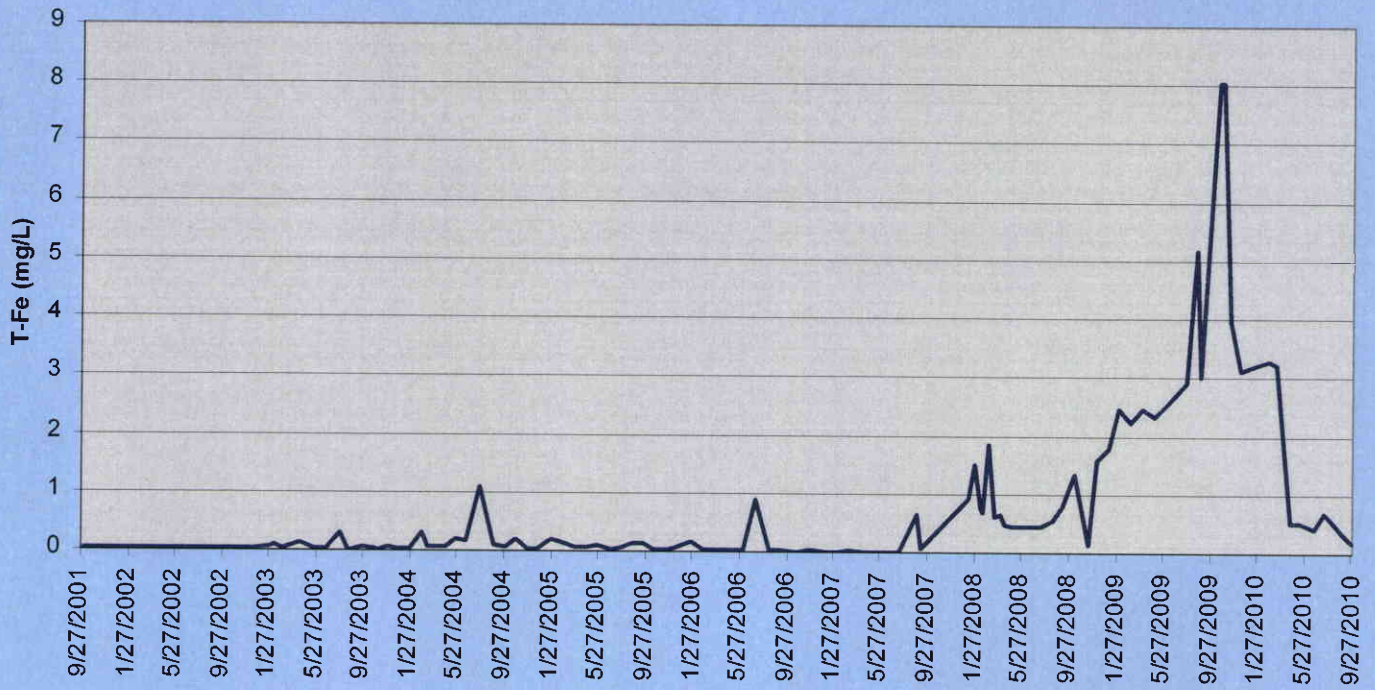
Page 7-35 of the MRP states that surface water samples collected during the low flow period every 5 years will be analyzed for baseline parameters (See Table 7-9). The 4th quarter of 2010 will be the next sampling event where baseline data will be required.

5. Based on your review, what further actions, if any, do you recommend?

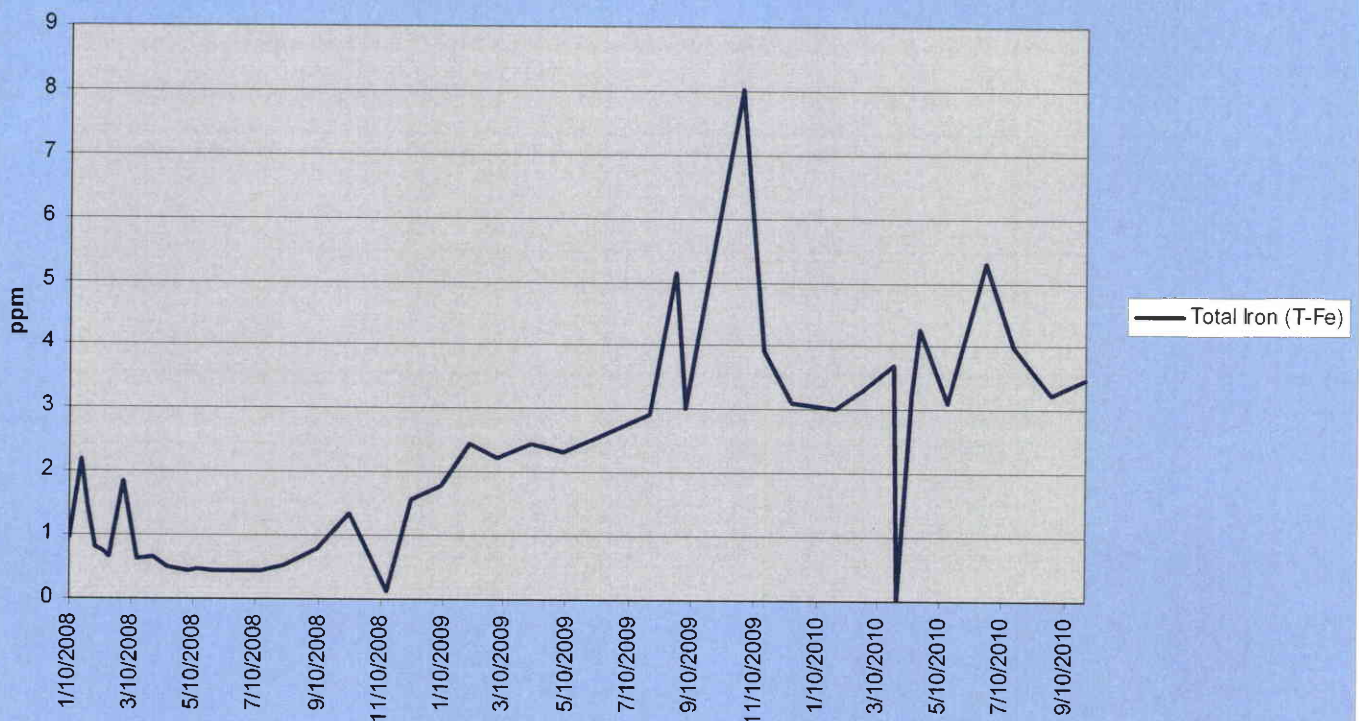
Continued data collection and monitoring of the mine-water discharge will be necessary to evaluate the effectiveness of the mine-water treatment system. Monitoring of the pre-treatment mine-water will help determine the overall chemistry of the raw mine-water and help determine if the T-Fe concentrations are showing any change in concentration.

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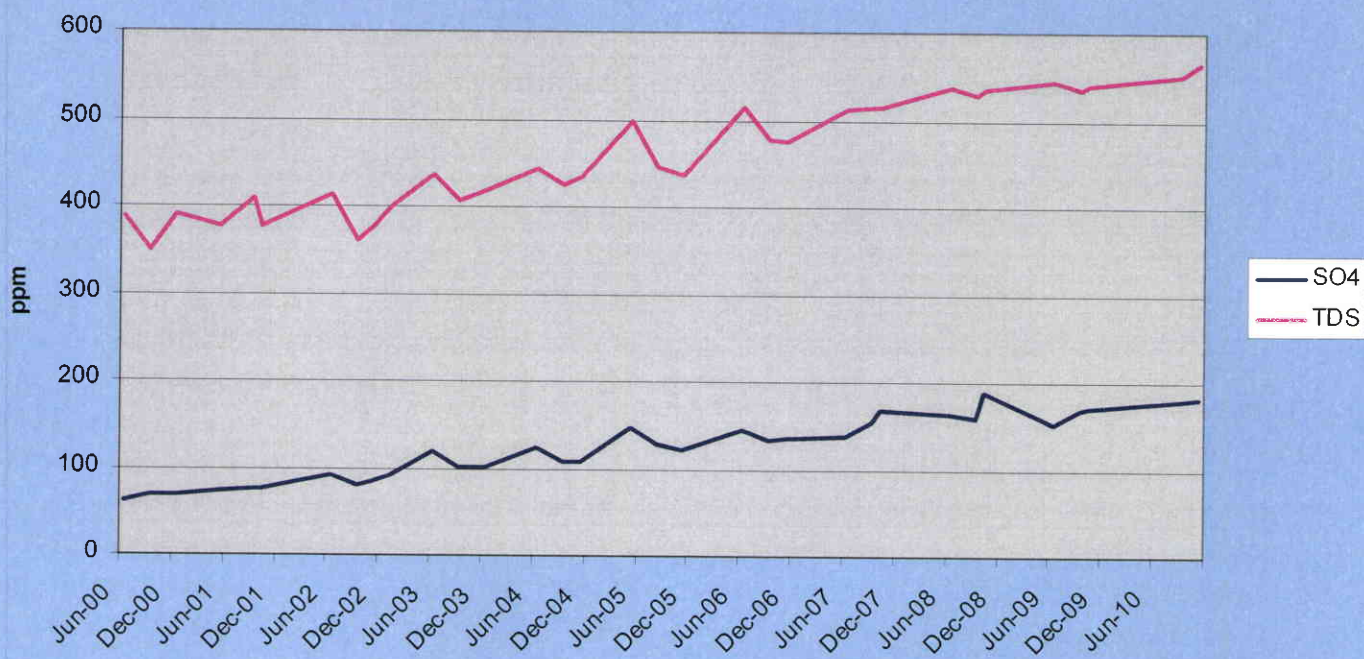
Total Iron (T-Fe): Outfall 002



Pre-Treatment Mine Water



Spring SP-58 Water Quality



Spring SP1-33

